

REMARKS

This Amendment is filed in response to the Final Office Action dated June 24, 2008, which has a shortened statutory period set to expire September 24, 2008.

Overview of the Admitted Prior Art and the Invention

A conventional prior art system can include multiple static timing analysis (STA) tools that use various set-ups for modes and corners. See, e.g. Figure 1B, tools 100A, 100B, and 100C. Notably, as taught by Applicant in the Specification, paragraphs [0006-0007] and referring to Figure 1B:

As STA tools 102A-102C complete their analysis, user 112 can review the results of the static timing analysis and perform debugging 113, as necessary, to mitigate timing violations. Of importance, user 112 must manually perform this user analysis/debugging 113 on results 103A-103C. Unfortunately, results 103A-103C typically form large, complex files in which each critical path in the design must be individually extracted for path profiling. Moreover, performing a comprehensive static timing analysis using available modes and corners can take many runs, e.g. 100-200 runs. Therefore, managing and/or merging the results from these runs can be very complex and time consuming.

Therefore, a need arises for a system and method of efficiently managing multiple static timing analysis runs using multiple modes/corners.

Applicant provides an STA system and method that can manage multiple runs having different parameters and automatically merge the results from those runs. Specification, paragraph [0009]. Parameters can include, for example, a plurality of modes and corners. Specification, paragraph [0009]. Exemplary modes can include a test mode, a normal operation mode, and a power-down mode, whereas exemplary corners can include process parameters including minimum/maximum temperatures as well as minimum/maximum voltages. Specification, paragraph [0009].

Notably, the saved results from each run can include intermediate results to support arbitrary queries. Specification, paragraph [0027]. These intermediate results can include a predetermined set of parameters that can be advantageously used in creating additional results. Specification, paragraph [0027]. Exemplary saved results are listed in the Specification, paragraph [0028].

By analyzing such intermediate results to construct the merged results, a user can quickly and intelligently make decisions in debugging a design. Specification, paragraph [0017]. For example, the merged results can advantageously indicate whether the design has been exhaustively analyzed for a mode and/or corner, whether the design has been exhaustively analyzed for all corners/modes, and what parts of the design have not been analyzed. Specification, paragraphs [0030-0031]. The merged results can also advantageously indicate for each path a percentage of times that timing violations exist for all analyzed modes and corners. Specification, paragraph [0012].

Claims 1, 3-9, 12-19, 25, 27-30, 32-43, 45, 47-53, 55-62, 64-70, 72-78, And 83-96 Are Patentable Over Schultz and Schulz

Claim 1, as amended, recites:

analyzing the intermediate results to construct merged results, the merged results outputting at least one of the following metadata: what parts of the design have not been analyzed and whether the design has been exhaustively analyzed for a particular corner/mode.

Applicant respectfully submits that neither Schultz nor Schulz teach the recited metadata. The Examiner cites paragraphs 0027-0029 and 0032-0033 of Schultz as teaching the step of analyzing the intermediate results to construct merged results. Paragraphs 0027-0029 teach that the multipass static

timing analysis results, which may include an area of interest, may be displayed using a schematic display tool. Paragraph 0032 teaches that all of the corner cases for analysis are defined in step 210 (see Figure 2). Step 212 then performs the STA for a particular corner case. The results from that STA are saved in step 214. Step 216 determines whether another corner case has not yet been analyzed for static timing. If so, then STA is performed for that corner case. Paragraph 0033 teaches that the multipass analysis comprises comparing the results of the various corner cases **to generate the change in values from one corner case to another**. Those components or nodes with high differences may indicate that they are particularly susceptible to potential problems.

As now recited in Claim 1, the merged results can then advantageously **output** at least one of: what parts of the design have not been analyzed and whether the design has been exhaustively analyzed for a particular corner mode. The Examiner argues that because multipass analysis is performed in step 218 that the results of this analysis must indicate that all corners have been exhaustively analyzed because otherwise step 216 would be violated. Applicant respectfully submits that the results of multipass analysis (as saved in step 220) would not indicate what parts of the design have not been analyzed or whether the design has been exhaustively analyzed for a particular corner mode. Indeed, Schultz explicitly teaches that the multipass analysis of step 218 compares the results of various corner cases to generate the change in values from one corner case to another. Paragraph 0033. Those nodes with high differences may indicate areas susceptible to potential problems. Paragraph 0033. Thus, **the results generated by Schultz do not output the recited metadata**.

Applicant's analysis of the intermediate results allow the merged results to provide a depth of analysis to a user that would not be possible using the combined teachings of Schulz and Schultz. Indeed, the recited merged results advantageously allow a user to quickly and intelligently make complex decisions in debugging a design. Because Schulz and Schultz fail to disclose or suggest the recited merged results and its advantages, Applicant requests reconsideration and withdrawal of the rejection of Claim 1.

Claims 3-9 and 12-18 depend from Claim 1 and therefore are patentable for at least the reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 3-9 and 12-18.

Claim 19 recites:

analyzing the intermediate results to construct merged results, wherein desired information regarding a predetermined set of modes/corners can be merged before other information.

The Examiner cites paragraphs 0027-0029 and 0032-0033 as teaching this limitation. Applicant respectfully traverses these characterizations. Paragraphs 0027-0029 teach that the multipass static timing analysis results, which may include an area of interest, may be displayed using a schematic display tool. Paragraph 0032 teaches that all of the corner cases for analysis are defined in step 210 (see Figure 2). Step 212 then performs the STA for a particular corner case. The results from that STA are saved in step 214. Step 216 determines whether another corner case has not yet been analyzed for static timing. If so, then STA is performed for that corner case. Paragraph 0033 teaches that the multipass analysis comprises comparing the results of the various corner cases to generate the change in values from one corner case to another. Those components or

nodes with high differences may indicate that they are particularly susceptible to potential problems.

Applicant respectfully submits that saving the multipass analysis in step 220 does not disclose or suggest constructing the merged results, wherein **desired information regarding a predetermined set of modes/corners can be merged before other information.** Therefore, Applicant requests reconsideration and withdrawal of the rejection of Claim 19.

Claim 25, as amended, recites in part:

a third set of instructions for analyzing the intermediate results to automatically construct and output merged results, ... the merged results indicating at least one of: what parts of the design have not been analyzed and whether the design has been exhaustively analyzed for a particular corner/mode.

Therefore, Claim 25 is patentable for substantially the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 25.

Claims 27-30 and 32 depend from Claim 25 and therefore are patentable for at least the reasons presented for Claim 25. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 27-33 and 32.

Claim 33 now recites in part:

a fourth set of instructions for merging desired information regarding a predetermined set of modes/corners before merging other information.

Therefore, Claim 33 is patentable for substantially the same reasons presented for Claim 19. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 33.

Claim 34 recites in part:

reporting the merged results, the merged results indicating at least one of: what parts of the design have not been analyzed and whether the design has been exhaustively analyzed for a particular corner/mode.

Therefore, Claim 34 is patentable for substantially the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 34.

Claims 35-43 depend from Claim 34 and therefore are patentable for at least the reasons presented for Claim 34. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 35-43.

Claim 45, as amended, recites in part:

analyzing the intermediate results to construct merged results, ... wherein the merged results indicate at least one of: what parts of the design have not been analyzed and whether the design has been exhaustively analyzed for a particular corner/mode.

Therefore, Claim 45 is patentable for the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 45.

Claims 47-53 and 55-61 depend from Claim 45 and therefore are patentable for at least the reasons presented for Claim 45. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 47-53 and 55-61.

Claim 62 recites in part:

analyzing the saved results to construct merged results, the merged results providing analysis coverage that reports parts of the design that are analyzed for each mode and corner as well as parts of the design that are not analyzed for each mode and corner.

The Examiner cites paragraph 0040 of Schultz as teaching this limitation. Applicant respectfully traverses this characterization. Paragraph 0040 teaches that the results display of step 408 comprises choosing an area of interest in step 410, choosing the results analysis to display in step 412, and then displaying the results graphically in step 414. Applicant notes that the "results" taught by Schultz comprise changes in values from one corner case to another. Paragraph 0033. As taught by Schultz, before multipass analysis is performed (as well as before that multipass analysis can be saved), the static timing analysis for all corner cases must be performed. See Figure 2, steps 210-220. Therefore, Schultz cannot disclose or suggest the recited merged results that provide analysis coverage that reports parts of the design that are not analyzed for each mode and corner. Therefore, Applicant requests reconsideration and withdrawal of the rejection of Claim 62.

Claims 64-70 and 72-78 depend from Claim 62 and therefore are patentable for at least the reasons presented for Claim 62. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 64-70 and 72-78.

Claim 83 recites in part:

analyzing the intermediate results to construct merged results, the merged results indicating for each path a percentage of times that timing violations exist for all analyzed modes and corners.

The Examiner admits that Schultz and Schulz do not teach this limitation. However, the Examiner cites Ernst as remedying the deficiency of Schulz and Schultz with respect to Claim 83. Applicant respectfully traverses this characterization. Specifically, Section 2 (which includes subsections 2.1, 2.2, and 2.3, and covers over 3 pages of text and figures) teaches

Razor error detection/correction. The idea of Razor is to tune a supply voltage by monitoring the error rate (i.e. speed path failures) during operation. Section 1. According to Ernst in subsection 2.3, a control system works to maintain a constant error rate of  $E_{ref}$ . Specifically,

At regular intervals the error rate of the system is measured by resetting an error counter which is sampled after a fixed period of time. The computed error rate for the sample  $E_{sample}$  is then subtracted from the reference error rate to produce the error rate differential  $E_{diff}$ .  $E_{diff}$  is the input to the voltage control function, which sets the target voltage for the voltage regulator. If  $E_{diff}$  is negative the system is [experiencing] too many errors, and voltage should be increased. If  $E_{diff}$  is positive the error rate is too low and voltage should be lowered. The magnitude of  $E_{diff}$  indicates the degree to which the system is "out of tune".

Notably, Ernst fails to disclose or suggest the recited merged results that indicate **for each path a percentage of times that timing violations exist for all analyzed modes and corners**. Therefore, Applicant requests reconsideration and withdrawal of the rejection of Claim 83.

Claims 84-96 depend from Claim 83 and therefore are patentable for at least the reasons presented for Claim 83. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 84-96.

#### Applicant Addresses 112 Rejections

The Examiner has indicated that the clause "for each path" in Claim 82 is unclear. Applicant has clarified Claim 83 to recite, "performing multiple static timing analysis runs with paths of the design". Applicant respectfully submits that a path of a design is a term of art that is understood by those skilled in the art of static timing analysis. Indeed, Schultz

(US Publication 2004/0044976) refers to "a path of interest" in paragraph 0029. Schulz teaches that "static tools sum up and compare delays through paths, relative to predefined clocks." Page 2, line 3-4. Because a path of a design is clearly understood and used by those skilled in the art, Applicant requests reconsideration and withdrawal of the Examiner's rejection of Claim 83.

Claims 84-96 depend from Claim 82 and therefore are patentable for at least the reasons presented for Claim 82. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 83-96.

CONCLUSION

Claims 1, 3-9, 12-19, 25, 27-30, 32-43, 45, 47-53, 55-62, 64-70, 72-78, and 83-96 are pending in the present application. Allowance of these claims is respectfully requested.

If there are any questions, please telephone the undersigned at 408-451-5907 to expedite prosecution of this case.

Respectfully submitted,



Customer No.: 35273

Jeanette S. Harms  
Attorney for Applicant  
Reg. No. 35,537